



Science

1st Term

Preparatory One



Content



Unit One

Matter Construction





Lesson one

Matter and its characteristics

Matter: anything has mass and volume.

- **Characteristics to differentiate between matter:**

1. **Color**:
   - Iron – Silver – Gold.
   - We can differentiate them by colors.




2. **Taste**:
   - Flour – sugar – table salt
   - We can differentiate them by tastes.





Smell:
   - Oil – vinegar – perfume
   - We can differentiate them by smells.





Important Note:



Color, taste and smell can differentiate between some materials because they are
- Tasteless, colorless and odorless
- Some materials are dangerous

- **Physical properties and chemical properties of matter:**

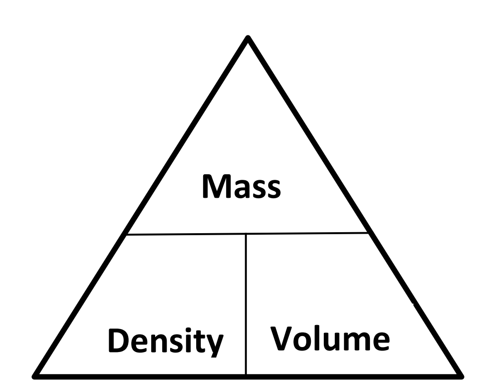
1. Density
2. Melting and boiling points
3. Hardness
4. Electrical conductivity
5. Thermal conductivity
6. Chemical activity of metals



1. Density.

- **Density:**
  - The mass of unit volume
  - The mass of 1 cm^3

- Measuring unit is **g/cm^3**



Density= Mass ÷ Volume

Volume= Mass ÷ Density

Mass= Density × Volume

<u>Problem Models</u>:

1. **A piece of Iron has a volume of 10 cm^3 and a mass of 78 g. Find its density**
   - Density = Mass ÷ Volume
   - Density = 78 ÷ 10 = 7.8 g/cm^3

2. **A piece of wood has a density of 0.4 g/cm^3 and a volume of 20 cm^3. Find its mass**
   - Mass=Density × Volume
   - Mass= 0.4 × 20= 8 g

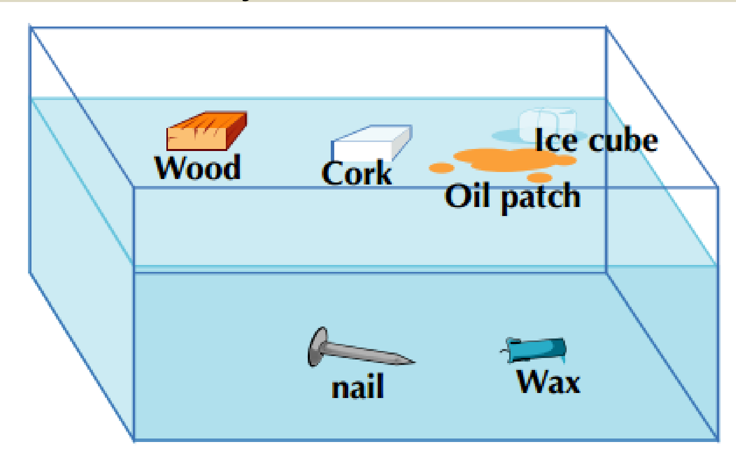
<u>What is meant by?</u>

1. **The wood has a density of "<u>0.4 g/cm^3</u>"?**
   The mass of 1 cm3 of wood is 0.4 g

2. **The mercury has a density of "<u>13 g/cm^3</u>"?**
   The mass of 1 cm3 of mercury is 13 g



To compare between the density of some substances and water



Steps:

Fill a bowl with water and put the following substances

1. A piece of wood
2. An iron nail
3. An ice cube
4. A piece of cork
5. A piece of wax
6. Drops of oil



Observation:

What happens to the following substances?

Put √ in front of the correct one

	Mass	Volume	Density	You know Water density = 1 g/cm³	
				Float	sink
Wax	18 g ÷	10 cm³			
Nail	78 g ÷	10 cm³			
Ice cube	9 g ÷	10 cm³			
Cork	5 g ÷	10 cm³			
Wood	4 g ÷	10 cm³			
Oil	8 g ÷	10 cm³			

Conclusion:

- Substances that have a density **less** than the density of water **float**
- Substances that have a density **more** than the density of water **sink**

<u>Give Reason:</u>

1. **Equal volumes of different materials have different masses.**
1. **Equal masses of different materials have different volumes.**
    1. Because they have different densities

2. **The cork & wood float on the water surface**
    2. Because the density of wood & cork is less than the density of water.

3. **The glass & Iron sinks in the water**
    3. Because the density of glass and Iron is more than the density of water.

Applications on the density:

1. Determination the purity of matter

The change in the density refers to the change in matter quality

- <u>For example.</u>

Determination of the quality of powdered milk, when compared with density the natural milk.

2. Water cannot put out petrol fires. (Give Reason)

Because the density of the oil is less than the density of the water so, it floats over the water and cannot put out fire.

3. Hydrogen or Helium balloons rise up in air. (Give Reason)

Because the density of helium and hydrogen is less than the density of the air so, it rises up in the air.



2. Melting point and boiling points.

Melting point:

The temperature at which substance changes from solid to liquid

- **Different solids have different melting points:**

1. Some solid substances have **low melting points** such as
   - ***Wax***, ***Butter*** and ***Ice***.





2. Some solid substances have **high melting points** such as

- ***Iron***, ***gold*** and ***Aluminum***





Boiling point:

The substance changes from the liquid state to the gaseous state at the temperature.

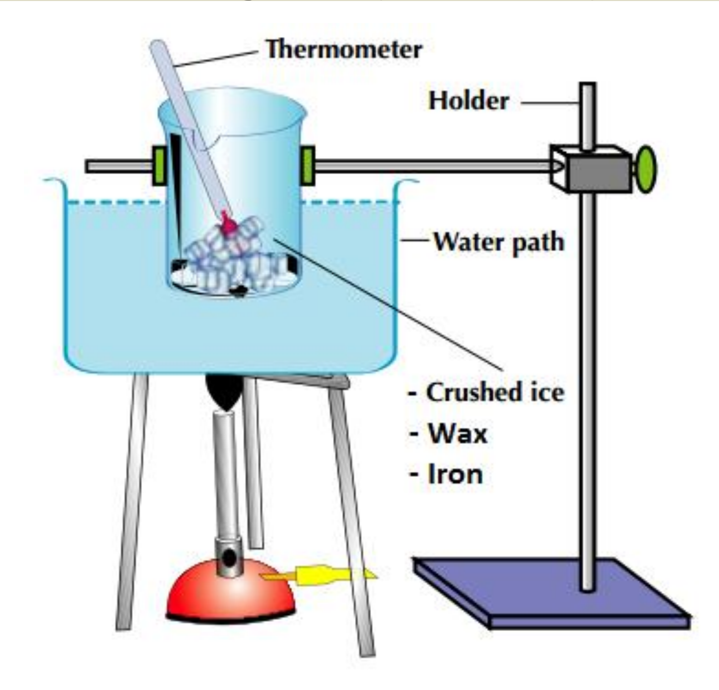
Applications:

1. **In making of alloys.**
   a. ***Copper – gold* Alloy**: used in making jewels.
   b. ***Nickel – chrome* Alloy**: used in making heating coils.

2. **In the manufacture of cooking pans from aluminum.**
   Because, Aluminum has high melting point.



To study matter and the melting point (fusion point)



Steps:

1. Put a beaker containing (ice – wax – iron) in a water bath
2. Put the water bath on a flame for a period of time
3. Use the thermometer to stop heating at 100 ˚c

Observation:

What happens when you heat the following substances to 100˚c**?**



Put √ in front of the correct one

	Ice		Wax		Iron	
	Melts	Doesn't melt	Melts	Doesn't melt	Melts	Doesn't melt
At 5 ˚c						
At 40 ˚c						
At 100 ˚c						

Conclusion

- Each substances have a different melting point.
- Some substances have a low melting point [butter, ice, wax]



3. Hardness.

- Some solid substances are soft at the room temperature
  - **(Rubber – Plastic – Clothes)**
- Some solid substances need heat to be soften
  - **(Iron – Copper – Aluminum)**
- Some solid substances do not melt by heating
  - **(Coal – Sulphur – Wood)**

Life Applications on Hardness:

1. **Iron is better than Copper in concrete buildings. (Give Reason)**
   Because, iron is harder than copper.



2. **Screwdrivers are made of steel iron. (Give Reason)**
   Because it is very hard.

4. Thermal conductivity

Heat Conductors	Heat Insulators
Substances that allow heat to flow • Iron • Copper • Aluminum	Substances that do not allow heat to flow • Wood • Plastic • Air
Heat Conductor	**Heat Insulator**

5. Electric conductivity

Electric Conductors	Electric Insulators
Substances that allow electricity to flow	Substances that don't allow electricity to flow
• Metals as (*Iron*, *Copper* and *Aluminum*)	• Non-Metals as (*Wood*, *Sulphur* and *Plastic*)
Electric Conductor	**Electric Insulator**
• Salt solution • Acidic solution (lemon) • Alkaline solutions (shampoo) • Water	• Sugary solutions • Air • Benzene • Oil

Life Applications on Electric & Thermal Conduction:

1. **Electric wires (cables) are made of copper or Aluminum.**
   Bec. They are electric conductors.

2. **Electric wires (cables) are covered with Plastic**
   Bec. Plastic is electric insulator.



3. **Cooking pans are made of Aluminum.**
   Bec. They are heat conductors.

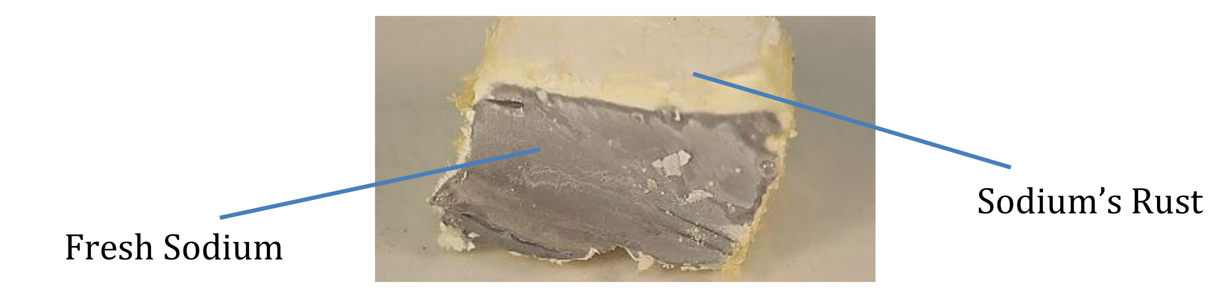
4. **Handles of cooking pans are made of plastic or wood.**
   Bec. They are heat insulator.

6. Metals & chemical activity.

Very active metals	Less active metals	Inactive metals
They lose their luster once they exposed to air	They rust after long time exposed to air	They don't react with air
Sodium – potassium	Iron – aluminum – copper	Silver – gold

Life Application on chemical Activity:

1. **Sodium loses its luster if exposed to the atmospheric air. (Give Reason)**
   Bec. It is very active metals.



2. **Steel bridges are coated with inactive material. (Give Reason)**
   To protect the iron from rust.

3. **Iron rust while exposing to the air. (Give Reason)**
   Bec, it is a less active metal.



Lesson Review

Q1: Complete the following:

1. Matter is anything that has ------------------- and ------------------
2. We distinguish between gold and silver by their different -------------------------
3. We differentiate between table salt and sugar by their different ------------------
4. We differentiate between perfume and vinegar by their different ----------------
5. Density is the mass of ---------------------------------
6. Golden jewels are made of --------------------------------- Alloy, while the heating coils are made up of ------------------------------ Alloy.
7. The measuring unit of density is ----------------------------
8. Equal volumes of different substances have different --------------------------- because they have different densities.
9. Melting point is --------------------------- at which substances change from solid state to ---------------------------- state.
10. There are materials don't soften by heating such as ----------------------------
11. Electric insulators are made up of materials such as ------------------------------ and --------------------------------
12. Jewels are made of ------------------------------------ alloy, while heating coils are made of ---------------------------.
13. There are good conductors of electricity and heat such as ---------------------- and --------------------------- while there are bad conductors of electricity and heat such as ---------------------------- and --------------------------------
14. Active metals lose their -------------------- when they are exposed to moist air.
15. Gases are ----------------------------- conductors of electricity.
16. Acidic solution is ------------------------ conductor of electricity.



Q2: Choose the correct answer:

1. The color property is a distinguishing factor between -----------------

a. table salt and flour **b.** iron and gold
c. oxygen and nitrogen **d.** oxygen and carbon dioxide

2. The measuring unit of density is -----------------------

a. gm/m^3 **b.** gm/cm
c. $gm\ /cm^3$ **d.** gm/cm^2

3. Handles of Cooking pans are made of -----------------------------

a. Iron **b.** plastic
c. aluminum **d.** stainless steel

4. Equal masses of different substances have different -----------------------------

a. volumes only **b.** densities only
c. lengths only **d.** volumes and densities

5. The handles of cooking pans are made of ---------------------------------

a. Iron **b.** plastic
c. wood **d.** wood and plastic

6. All the following solutions conduct electricity except -----------------------

a. Salt solution **b.** Alkaline solution
c. acidic solution **d.** sugary solution

7. All the following substances are heat conductors except -----------------

a. Wood **b.** aluminum
c. copper **d.** iron

8. The property of electrical conductivity is a distinguishing factor --------------

a. wood and plastic **b.** no correct answer
c. iron and wood **d.** iron and copper

9. One of the elements which don't react with oxygen of air is --------------

a. Potassium **b.** Sodium
c. Aluminum **d.** Gold



Q3: Give Reason for the following:

1. Wood floats over the water surface while iron sinks.

----

2. Equal masses of different substances have different volumes.

----

3. Balloons filled with Helium and Hydrogen rise up in the air.

----

4. Water cannot put out Petrol fire.

----

5. We use Aluminum in making cooking pans.

----

6. Steel bridges are painted with inactive material.

----

7. It is preferable to use iron with concrete in building than copper

----

----

8. Sodium loses its luster once it exposes to the atmospheric air.



Q4: Problems:

1. **A piece of iron has a mass of 30 kg and a volume of 0.3 m^3. Find its density**

   ----

2. **An amount of milk has a mass of 300 g and a density of 0.6 g/cm^3.Find it volume**

Q5: What is meant by?

1. **The density of water is 1 g/cm^3.**

   ----

2. **The density of mercury is 13 g/cm^3.**

   ----

3. **The melting point of iron is 1538 °C**

   ----

4. **The boiling point of water is 100 °C**



Lesson Two:

Matter Construction

Molecules:
It is the smallest building unit of the matter that can exist freely

- **Properties of the molecules of matter:**
  1. Molecules keep the properties of matter
  2. Molecules are in a state of continuous motion in all directions
  3. There are spaces between the molecules of matter
  4. There are forces between the molecules of matter

Intermolecular spaces:
The spaces between the molecules of the matter.

Intermolecular force:
The force connects the molecules of the matter together.

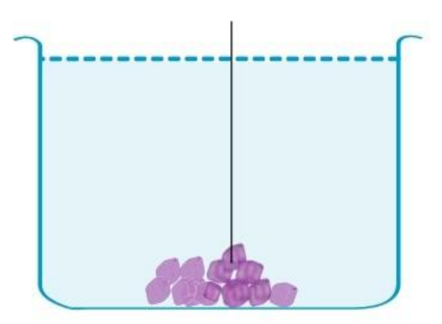
Molecules	Solid state	Liquid state	Gaseous state
Motion	Vibrate **Limited**	Slide past each other **Free**	Fast, randomly **Completely Free**
Intermolecular spaces:	Very narrow	Far	Very far
Intermolecular forces:	Strong	Weak	Very weak
Volume:	Definite	Definite	Indefinite
Shape:	Definite	Indefinite	Indefinite

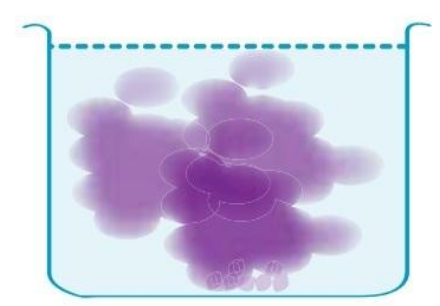


Science Activity

1. The matter consists of tiny molecules which are in a continuous motion:

Permanganate





<u>Observation:</u>

- **What happens when you add some permanganate [violet] to a beaker contains an amount of water?**

Put √ in front of the correct one

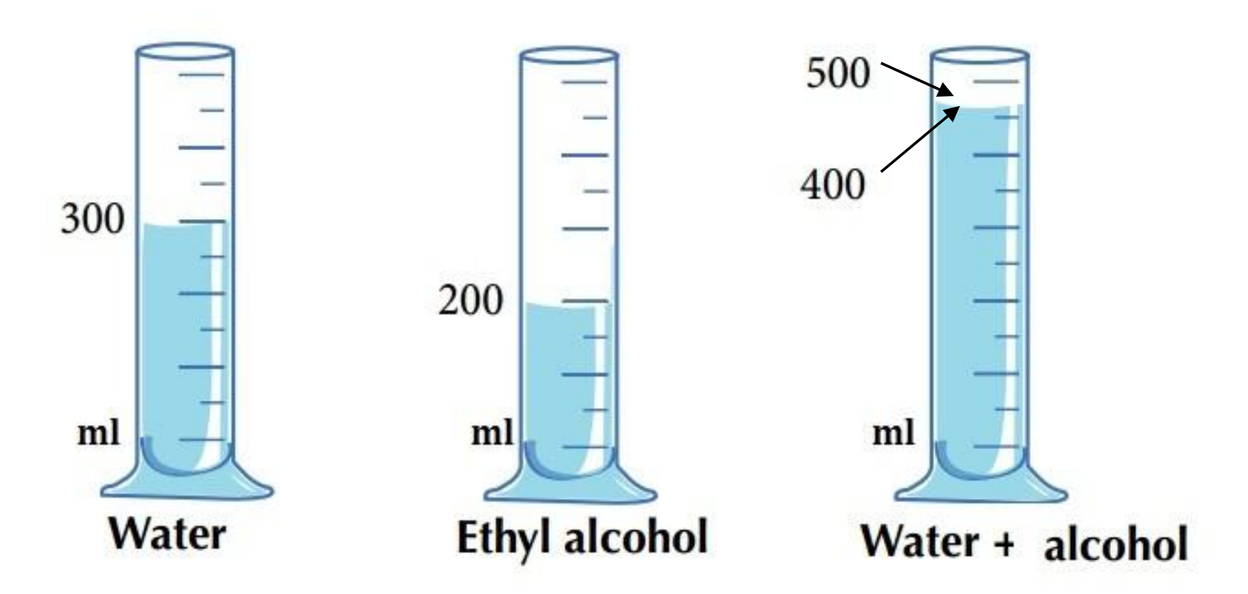
The violet colour stays in place		
The violet colour doesn't spreads all over the water		
The violet colour spreads all over the water		

<u>Conclusion:</u>

- The matter consists of tiny parts called Molecules
- Molecules of matter are in a state of continuous motion.

Science Activity

2. The presence of intermolecular spaces between the molecules of matter.



Observation:

What happens when you add 300 ml of water to 200 ml of alcohol then observe the total volume?

Put √ in front of the correct one

The total volume = 500 ml	
The total volume is less than 500 ml	
The total volume is more than 500 ml	

Conclusion

- There are intermolecular spaces between the molecules of matter.
  - **Explanation,** As the molecules of the alcohol fill the intermolecular spaces of the water



Give Reason:

1. **When you put a drop of ink in the water, it spreads.**
   Because the ink molecules have a continuous motion in all direction

2. **Solids have definite shape and volume.**
3. **It is hard to break iron rod.**
   Because Iron has very strong intermolecular forces.

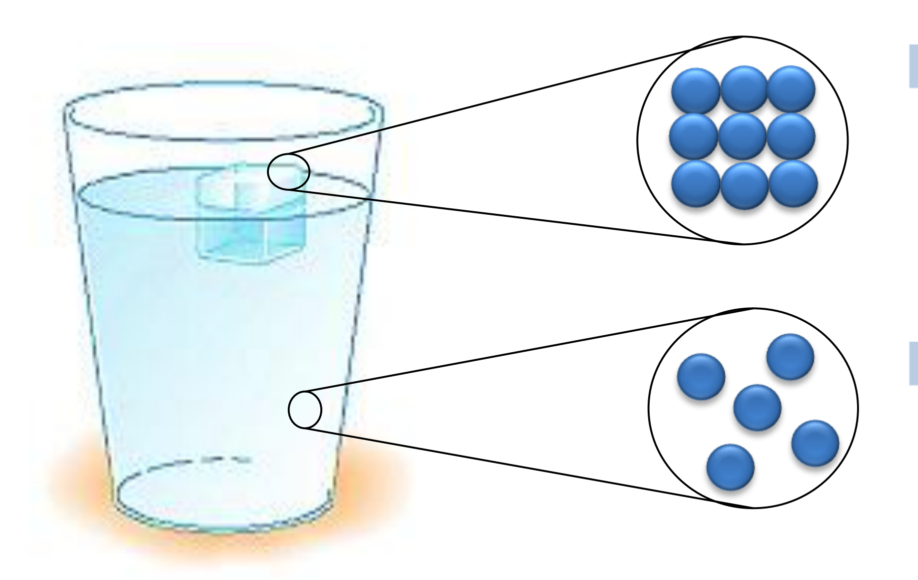
4. **Liquids have indefinite shape and definite volumes.**
5. **It is easy to make an amount water into portions.**
   Because they have weak intermolecular forces.

6. **Gases have indefinite volume and shape.**
   Because gases have very weak intermolecular forces

Changes of matter:

1. **Melting**:
   The change of matter from solid state to liquid state by heating.

   - **Matter changes from solid state to liquid state by heating. (G.R)**
     Because the energy of molecules increase so they move faster, and the spaces increase then changes into liquid



Ice Molecules

- Vibrate In place
- Regular pattern

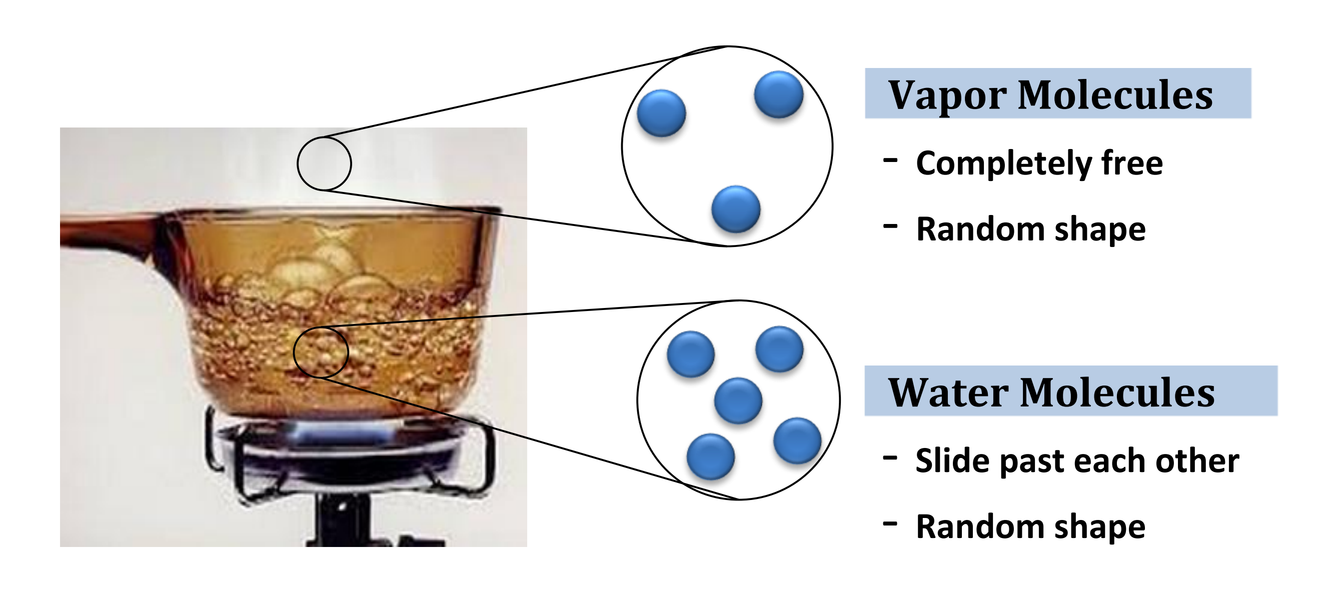
Water Molecules

- Slide past each other
- Random shape



2. **Vaporization**:
   The change of matter from liquid state to gas state by heating.

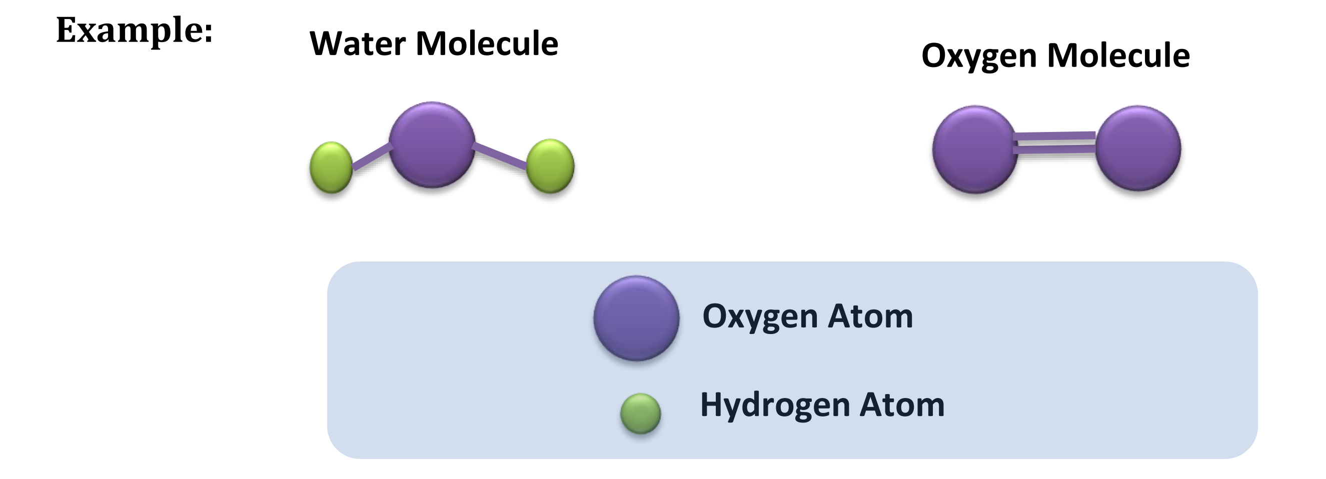
   - **Matter changes from liquid state to gas state by heating. (G.R)**
     Because the energy of molecules increase so they speed increase, and the spaces increase then changes into gas



Important Note:

- The molecules composed of tiny particles called Atoms.
- **Atom**: The basic building unit of molecule, which cannot exist freely.

Example:



Types of Molecules:

Types of Molecules			
Molecules of an elements		**Molecules of a compound**	
Element: • The simplest form of matter that don't break down into simpler substance.		**Compound:** • The chemical combination of two or more elements with fixed ratio.	
It is a substance composed of similar kind of atoms.		**It is a substance composed of different kinds of atoms.**	
Example		**Example**	
(Na) sodium		**(NaCl) table Salt**	
(H_2) Hydrogen		**(H_2O) Water**	
(O_3) Ozone		**(CO_2) Carbon dioxide**	



Important Note:

- **Elements may be <u>solid</u>, <u>liquid</u> or <u>gas</u>**
- **Elements may be**
  - **Monoatomic**: composed of one atom (Iron)
  - **Diatomic**: composed of two atoms (Oxygen)
  - **Triatomic**: composed of three atoms (Ozone)

Types of elements:

Types of Elements			
	Solids	**Mono-atomic**	- Carbon **(C)** - Silver **(Ag)** - Sodium **(Na)** - Iron **(Fe)** - Calcium **(Ca)**
	Liquids	**Mono-atomic**	Only Mercury **(Hg)**
		Di-atomic	Only Bromine **(Br_2)**
	Gases	**Mono-atomic**	**<u>Inactive gases</u>** - Helium **(He)** - Neon **(Ne)**
		Di-atomic	**<u>Active gases</u>** - Oxygen **(O_2)** - Hydrogen **(H_2)**



Important Note:

- Compounds may be <u>solid</u>, <u>liquid</u> or <u>gas</u>
- Compound are made up of different elements and atoms

How many elements and atoms? Na_2SO_4

Capital Letters = Elements	Lower Numbers = Atoms
— Count the capital letters N → 3 Elements O → 3 Elements S → 3 Elements	— Count the lower numbers Na = 2 → 7 Atoms S = 1 → 7 Atoms O = 4 → 7 Atoms

<u>Chemical formula:</u>
A set of chemical symbols represent the number and the kind of elements.

Name of the molecule	Chemical formula	Number of atoms	Number of elements
1. Water	H_2O	3	2
2. Sodium chloride	NaCl	2	2
3. Ammonia	NH_3	4	2



Lesson Review

Q1: Complete the following:

1. The ------------------------ is the basic building unit of matter
2. The molecules have intermolecular ------------------------- and ------------------
3. The solids have ------------------- shape and ---------------------- volume.
4. The gases have -------------------- shape and ------------------------ volume.
5. The liquids have ----------------------- shape and ----------------------- volume.
6. The ---------------------------- is the simplest form of matter that cannot be analyzed (broken down)
7. Melting process is the change of matter from -------------------- to ----------------
8. Evaporation process is the change from -------------------- to ----------------------
9. When the any substance is heated the intermolecular spaces ---------------------- and the intermolecular forces ----------------------
10. The molecules composed of tiny particles whish are called -----------------------
11. The molecules of element composed of ------------------------- atoms.
12. The molecules of a compound composed of ------------------------- atoms.
13. Some solid element composed of one atom such as --------------------------- and other liquids composed of one atom such as ---------------------------- while other have two atoms such as ---------------------------
14. Gaseous elements composed of one atom such as……………………………….., while other gaseous elements have two atoms such as…………………………..
15. The chemical formula is a set of -------------------------------- shows the numbers and the kind of elements.



Q2: Give Reason:

1. **When you put a drop of ink in the water it spreads in the whole water**

   ----
2. **It is hard to break iron rod**

   ----
3. **It is easy to make an amount water into portions**

   ----
4. **Solids have definite shape and volume.**

   ----
5. **Liquids take the shape of the container.**

   ----
6. **Gases take the shape and the volume of the container.**

   ----
7. **Solids changes to liquid by heating.**

Q3: How many atoms and elements are in the following molecules?

1. **NH_3 (Ammonia gas)**
   - ----------------- atoms, ---------------- element
2. **H_2SO_4 (Sulphuric Acid)**
   - ----------------- atoms, ----------------- element

Q4: What happens when?

1. **You put a drop of ink in the water.**

   ----

2. **You heat a piece of iron strongly.**

   ----

3. **You add 300 ml of water to 200 ml of alcohol and observe the total volume.**

Q5: Compare the elements molecule and the compound molecule:

	Element molecule	Compound molecule
Definition		
Atoms		
Example		



Lesson Three:

Atomic structure of matter

Atom

The basic building unit of matter that cannot exist freely

- **Properties of an Atom**:

1. The atom cannot be found in a free state, but it combines with other atoms
2. Atoms of an element are similar, and differs from another element.

The chemical symbols of the important elements:

Element	Symbol
Hydrogen	$_{1}H$
Helium	$_{2}He$
Lithium	$_{3}Li$
Beryllium	$_{4}Be$
Boron	$_{5}B$
Carbon	$_{6}C$
Nitrogen	$_{7}N$
Oxygen	$_{8}O$
Fluorine	$_{9}F$

Element	Symbol
Neon	$_{10}Ne$
Sodium	$_{11}Na$
Magnesium	$_{12}Mg$
Aluminum	$_{13}Al$
Silicon	$_{14}Si$
Phosphorus	$_{15}P$
Sulphur	$_{16}S$
Chlorine	$_{17}Cl$
Argon	$_{18}Ar$

Element	Symbol
Potassium	$_{19}K$
Calcium	$_{20}Ca$
Iron	Fe
Zinc	Zn
Copper	Cu
Gold	Au
Silver	Ag
Iodine	I
Bromine	Br

Important Notes:

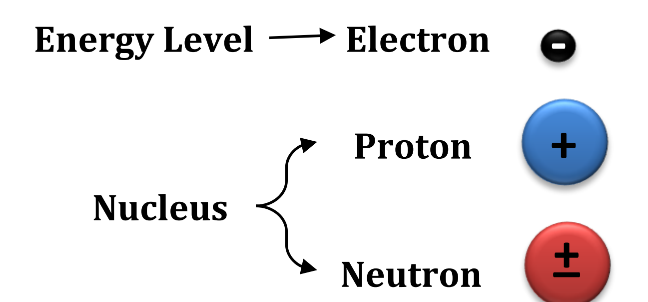
- **In Chemical symbols the first letter always written in capital letters.**
- **Chemical symbols are taken from the Latin not the English name**

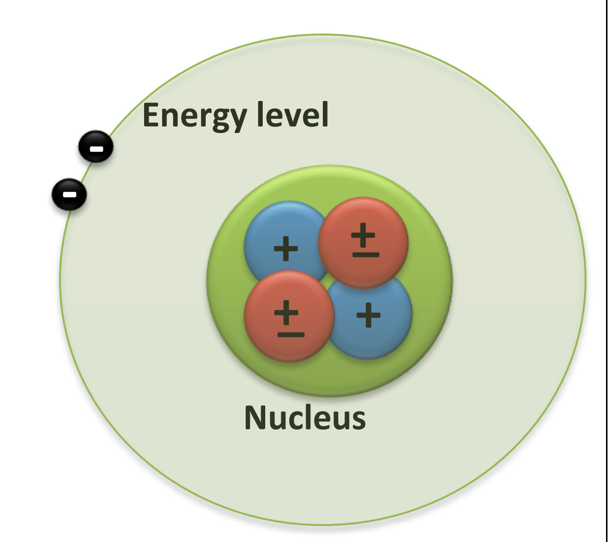
Sodium	Natrium	Na
Potassium	Kalium	K
Copper	Cuprum	Cu

The structure of the atom:

It consists of:

a. Nucleus
b. Energy Levels





a) Nucleus:

- Exist in the center of the atom.
- The mass of the atom is concentrated in it **(Give Reason)**
  Bec. It contains protons and neutrons

1- **Protons**: positively charged particles. (+ve)
2- **Neutrons**: electrically neutral particles (uncharged). (±ve)

b) Energy levels.

- **Energy level:** The paths of the electrons around the nucleus
- They are **7** energy levels (**K-L-M-N-O-P-Q**)
- They differ in size, energy and their capacity.

Electrons:

- Are very minute particles.
- Negatively charged particles. (-ve)
- Orbit the nucleus in energy levels
- Electrons orbit around the nucleus but do not fall in it. **(Give Reason)**
  Bec. They orbit with high speed and escape.

- **The atom is electrically neutral (G.R)**
  Bec. The number of electrons equals the number of protons



Comparing all the subatomic particles:

	Protons	Neutrons	Electrons
Position	In the nucleus	In the nucleus	Around the nucleus
Charge	Positive	Neutral	Negative
Mass	Greater than electron	Greater than electron	Extremely small [Can be neglected]

- **The atom of each element is expressed by a chemical symbol:**

  a. The mass number, written above the symbol from the left side.
  b. The atomic number, written below the symbol from the left side.

11	Atomic Number
Na	
23	Mass Number

1. Atomic number:

- The number of protons in the nucleus.
- The number of electrons around the nucleus

2. Mass number:

- It is the sum of the numbers of protons & neutrons in the nucleus.

Na Protons = 11

Na Electrons = 11

Na Neutrons = 23 -11 = 12



Science Activity

How to calculate the number of protons, electrons and neutrons:

Chlorine, $^{35}_{17}Cl$

Protons = 17

Electrons = 17

Neutrons = 18

Magnesium, $^{24}_{12}Mg$

Protons = ----------------

Electrons = ----------------

Neutrons = -----------------

Hydrogen, $^{1}_{1}H$

Protons = -----------------

Electrons = -----------------

Neutrons = -----------------

How to calculate the mass number and atomic number:

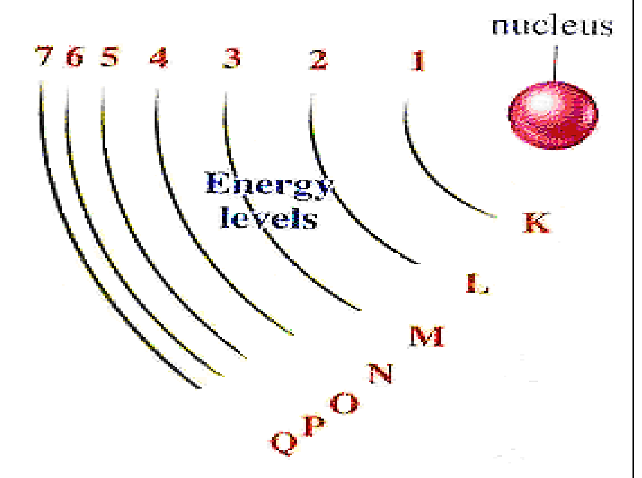
1. **If the nucleus of Oxygen atom contains 8 protons and neutrons. Find the atomic number and the mass number of Oxygen**
    - The atomic number = no. of protons = ---------------
    - The mass number = no. of protons + no. of neutrons =

      = ----------------- + ------------------- = ---------



<u>Energy levels:</u>
The orbits of electrons around the nucleus

- The energy level differs in energy.
- Energy of electron = Energy of level
- The energy increase away of the nucleus
- They are 7 main energy levels



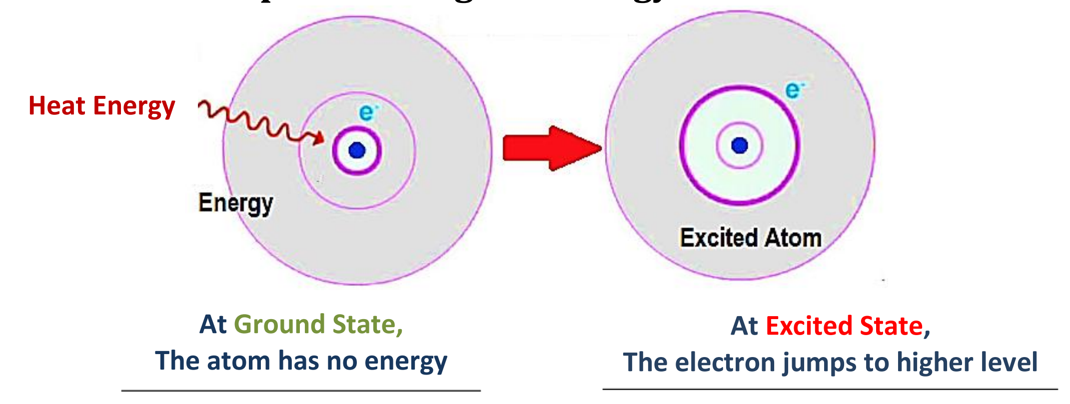
How to know the number of electrons that saturate the energy level:

The Rule: $2n^2$ where, (**n**) is number of the energy level
This rule works only with the first four energy levels. (G.R)

- Because the atom will be unstable.

1. <u>In the first energy level</u> (K) = $2(1)^2 = 2 \times 1 =$ **2 electrons**
2. <u>In the second energy level</u> (L) = 2 (2)2 = 2 x 4 = **8 electrons**
3. <u>In the third energy level</u> (M) = 2(3)2 = 2 x 9 = **18 electrons**
4. <u>In the fourth energy level</u> (N) = 2(4)2 = 2 x 16 = **32 electrons**

<u>Important Note:</u>
When an element heats up its atoms gains energy and become more excited



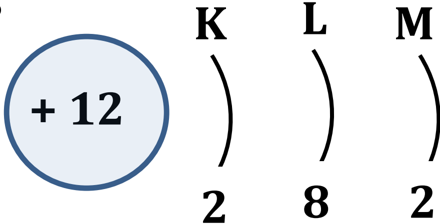
- ➢ **<u>Excited atom:</u>** The atom that gains a quantum of energy.
- ➢ **<u>Quantum:</u>** Amount of energy lost or gained by the electron



Science Activity

The electronic configuration

Magnesium, $_{12}Mg$

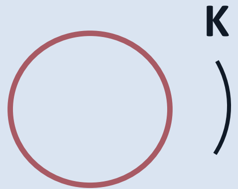


Why the energy level K filled before L?

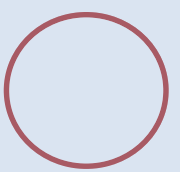
- Bec. The **K** level has lower energy than **L** level

Complete the following like the previous example by the help of figures:

Oxygen, $_{8}O$



Chlorine, $_{17}Cl$



Neon, $_{10}Ne$

Sodium, $_{11}Na$

Calcium, $_{20}Ca$



The electronic configuration & chemical activity

The number of electrons in the outermost energy level determines the activity of the atom

1. ***If the number of electrons in the outermost energy level is less than 8 electrons, the atom becomes unstable* (active), So** they do chemical reaction.

Example of, <u>active elements</u>

Element	Symbol	Electronic configuration		
		K	L	M
Sodium	**$_{11}$Na**	2	8	1
Magnesium	**$_{12}$ Mg**	2	8	2
Aluminum	**$_{13}$ AL**	2	8	3

Element	Symbol	Electronic configuration		
		K	L	M
Phosphorus	**$_{15}$P**	2	8	5
Sulphur	**$_{16}$ S**	2	8	6
Chlorine	**$_{17}$ Cl**	2	8	7

2. ***If the number of electrons in the outermost energy level equals 8 electrons, the atom becomes (inactive),* So** they do not do chemical reaction.

Example of, <u>inactive (noble) elements</u>

Element	Symbol	Electronic configuration		
		K	L	M
Helium	**$_{2}$He**	2	-	-
Neon	**$_{10}$Ne**	2	8	-
Argon	**$_{18}$Ar**	2	8	8



Lesson Review

Q1: Complete the following:

1. Atom can't be found in a ----------------------- state
2. Atoms of element are ------------------------------, while Atoms of compounds are ---------------------------------
3. The atom contains of --------------------, -------------------- and --------------------
4. The mass of the atom concentrated in -------------------------------
5. The --------------------- are positively charged, while the -------------------- are negatively charged
6. The electrons revolve around the nucleus in paths called --------------------
7. Atomic number is the number of -------------------------------- in the nucleus or the number of ---------------------------- around the nucleus.
8. Mass number of the number of --------------------- and ---------------------
9. The rule -------------------------- tells the numbers of the electrons fill the energy level
10. The **2nd** energy level satisfied by -------------------------- electrons.
11. Exited atom is the atom that gains --------------------------
12. The quantum is the amount of ------------------------------ lost or gained by an --------------------------- when it transfer from an energy level to another.
13. If the number of electrons in the outermost energy level is equal to 8, the atom becomes --------------------
14. If the number of the electrons in the outermost energy level is less than 8 electrons, the atom becomes --------------------



Q2: Write the chemical symbol or the chemical Name:

Write the chemical symbol	
Sodium	------------------------------
Iron	------------------------------
Magnesium	------------------------------
Bromine	------------------------------
Nitrogen	------------------------------
Calcium	------------------------------
Iron	------------------------------
Oxygen	------------------------------
Potassium	------------------------------
Copper	------------------------------

Write the chemical Name	
Hg	--
Ag	--
He	--
Cl	--
Zn	--
H	--
C	--
S	--
Ar	--
Ne	--

Q3: Calculate the following:

1. **If the nucleus of Sodium atom contains 11 protons and neutrons, find the atomic number and the mass number of Sodium**

   ----

2. **If the nucleus of Calcium atom contains 20 protons and the mass number is 40, find the atomic number and the number of neutrons**



Q4: What is meant by?

1. **The atomic number of Oxygen is 8**

   ----

2. **The mass number of Oxygen 16**

Q5: Give reason for each of the following:

1. **The mass of the atom is concentrated in the nucleus.**

   ----

2. **The atom is electrically neutral.**

   ----

3. **The nucleus is positively charged.**

   ----

4. **The rule $2n^2$ cannot be applied for the fifth energy level.**

   ----

5. **Some elements do chemical reaction.**

   ----

6. **Some elements are mono-atomic (never do chemical reaction).**



Q6: Write the electronic Configuration for the following elements:

1. ($_7N$)

2. ($_{19}K$)

3. ($_{17}Cl$)

4. ($_{13}Al$)

5. ($_{18}Ar$)

6. ($_3Li$)

7. ($_6C$)

Unit Two

Heat Energy





Lesson one:

Energy Resources

Energy.

The ability to do work.

- The fuel inside the engine burns and give the energy to move the car.
- The food inside our cells and produce the energy needed to do activities.

The fuel in the car is similar to the food in the body. (Give Reason)

Because both burn and produce, energy needed for work.

Work:

The force acts on a body and moves it for a distance in a certain direction.

Work (W) = Force (F) x Displacement (D)
(*Joule*) (*Newton*) (*Meter*)

Examples:

- A car moved for a distance 20 Meters pulling a piece of wood by a force of 75 Newton, Calculate the work done by this car.
  - **W = F x D**
    = 75 x 20 = 1500 Joule.

- A car moved for a distance 30 Meters pulling a piece of wood by a force of 20 Newton, Calculate the work done by this car.
  - **W = -------- x -------------**
    = -------- x ------------- = -------------- Joule.



Forms of Energy:

1. **Mechanical Energy:**
   (P.E + K.E) the energy stored in stretched spring.

2. **Electric Energy:**
   The energy produced from an electric generator.

3. **Sound Energy:**
   The energy produced by music player.

4. **Light Energy:**
   The energy produced by from the light bulb or the candle.

5. **Chemical Energy:**
   The energy stored in the car battery or the food.

6. **Heat Energy:**
   The energy produced from the heater or the stove.

7. **Nuclear Energy:**
   The energy produced from the nucleus of the atom.

Resources of the Energy:

1. **Permanent sources** of energy **(**sun only**)**
2. **Renewable sources** of energy. **(**Wind**,** Waterfalls**,** Tide and ebb**)**
3. **Non-renewable Sources** of energy.
   - The fuel **(**oil**,** Coal**,** natural gas**)**
   - The food **(**chemical reactions**)**
   - Nuclear Reactions **(**The reactions in the nucleus of the atom**)**

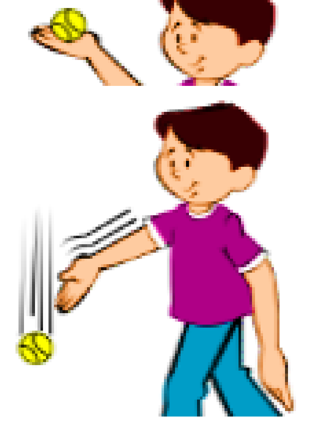
- **Some countries try to use the wind, energy to generate electricity (G.R)**
  Because they are cheap and clean



The Mechanical Energy:

Mechanical energy:

It is the summation of potential and kinetic energy.



- **The work done** = The **Mechanical** energy
  = **P.E** + **K.E**

- **Potential energy** (when you raise a ball from the ground)
- **Kinetic energy** (when you leave the ball to fall down).

Potential Energy

It is the stored energy in the object due its position.

The factors affecting the potential energy:

1. **The weight of the object.** **(P.E** directly proportional to **w)**
2. **The height of the object.** **(P.E** directly proportional to **h)**

Potential Energy (P.E)	**=**	**Height (h)**	**x**	**Weight (w).**
Joule		Meter		Newton

Kinetic Energy:

- It is the energy of the object due to its motion.

The factors affecting the kinetic energy:

1. The mass of the object. **(K.E** directly proportional to **m)**

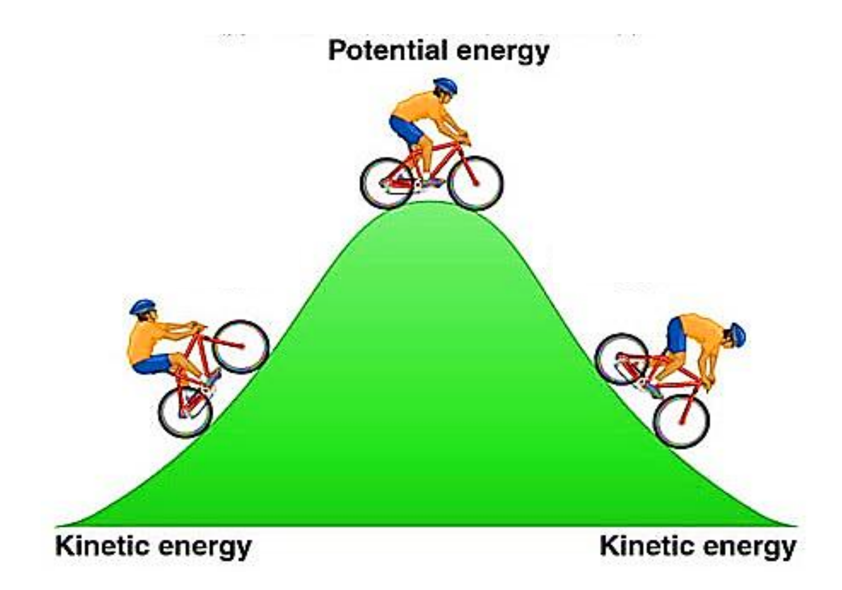
2. The velocity of the object. **(K.E** directly proportional to **V)**

Kinetic Energy (K.E)	**=**	$\frac{1}{2}$ **Mass (m)**	**x**	**Velocity² (V²)**
Joule		Kg		m/s



Important Note

- Each body has a constant value of mechanical energy
- Mechanical energy is directly to the potential and kinetic energy
- Potential energy is inversely proportional to the kinetic energy



- **At the highest point,** the object has only potential energy. [**max. Height**]
- **At the middle point,** the object has potential energy = kinetic energy
- **At the ground,** the object has only kinetic energy. [**max. speed**]

Give reason:

1. **An object moves horizontally has a constant potential energy.**
   Because the height does not change
2. **The potential energy of an object increases when the height increases.**
   Because the potential energy is directly proportional with the height
3. **The kinetic energy of an object increases when the velocity increases.**
   Because the kinetic energy is directly proportional with the velocity

Problem:

1. A stone has a mass of 0.4 K.g was thrown up and reached a height of 5 m, then its velocity was 4 m/sec. Calculate the following:

1. P.E **2. K.E** **3. M.E (Work)**

- **Weight** = m x 10 = 4 N

1. **P.E = weight x height.** = 4 × 5 = 20 joule
2. **K.E = 1/2 x mass x velocity** = 1/2 × 0.4 × 42 = 3.2 joule.
3. **[M.E] W = P.E + K.E** = 20 + 3.2 = 23.2 joule.

Practice:

2. A stone has a mass of 5 K.g was thrown up and reached a height of 6 m, then its velocity was 4 m/sec. Calculate the following:

1. P.E **2. K.E** **3. M.E (Work)**

----

3. An iron cylinder was lift by a pulley to the maximum height. Calculate the following:

1. **P.E when the object at the top**
2. **K.E when the object at the ground**

PE

KE

10 m



Lesson Review

Q1: Complete the following:

1. The ----------------- is the force acts on a body to move it for a distance
2. The measuring unit if Work is known as ------------------------
3. The renewable resources of energy such as --------------------------- while the non-renewable resources of energy such as ---------------------------------
4. The factors affecting on the Work done to an object are ----------------------------- and ---------------------------------
5. The factors that affecting the potential energy are --------------------------------- and ---------------------------------
6. The potential energy is the energy --------------------------------- in an object at rest.
7. The factors affecting the kinetic energy are --------------------------------- and ---------------------------------
8. The work-done for moving object equals ---------------------------------
9. The potential energy is --------------------------------- Proportional to height of the object from the surface of the earth.
10. A kind of energy produced form the atomic reactions in the nucleus is known as ---------------------------------
11. Each body has a constant value of --------------------------------- energy.
12. The kinetic energy is --------------------------------- Proportional to the velocity of the object.
13. The mechanical energy is the sum of --------------------- and ---------------------
14. The energy stored in the food molecules is ------------------------- energy
15. The energy used by plants in photosynthesis process -------------------- energy



Q2: Give Reason for each of the following:

1. **The food in the body is similar to the fuel in the car.**

 ----

2. **The renewable resources of energy are more common in use.**

 ----

3. **The potential energy of an object moves horizontally does not change.**

 ----

4. **The potential energy of an object increases when the height increases.**

 ----

5. **The kinetic energy of an object increases when the velocity increases.**

Q3: what happens for each of the following?

1. **An object moves horizontally (regarding the P.E)**

 ----

2. **An object moves with increasing speed (regarding the K.E)**

Q4: Match.

-------	Potential Energy	**1.** $\frac{1}{2} mv^2$
-------	Kinetic Energy	**2.** $F \times d$
-------	Mechanical energy	**3.** $m \times g \times h$
-------	Work	**4.** P.E + K.E

Q5: Problems

1. **Find the potential energy if the mass body (20 kg), height (10m) and gravity (10 m/sec^2)**

2. **Find the kinetic energy if the mass of the body is (5 kg), height (5m) and gravity (10 m/sec^2)**

3. **Find the mechanical energy if potential energy (20 Joule) and kinetic energy (30 Joule)?**

4. **An iron cylinder with a weight of 60 N, was lift up ward, then find**

a) At the top

1. **P.E**
2. **K.E**
3. **M.E**

b) At the middle

1. **P.E**
2. **K.E**

c) At the ground

1. **P.E**
2. **K.E**

10 m

Top

Middle

Ground



Lesson Two

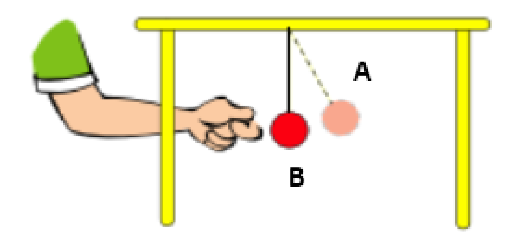
Energy Transformation

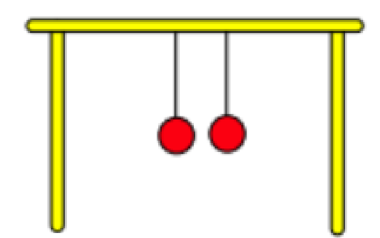
- The energy changes from one type to another, without losing any of its value.

Science Activity

Observation:

- **What happens when you flick the pendulum?**





Put √ in front of the correct one

	A	B
The potential energy reaches maximum at		
The kinetic energy reaches maximum at		

Do you think it is √ or X

The 2 balls raise up to the same height	
The mechanical energy of the 2 balls are the same	

Conclusion:

- The **P.E** and **K.E** changes but the mechanical energy is the same

The conservation law of Mechanical Energy:

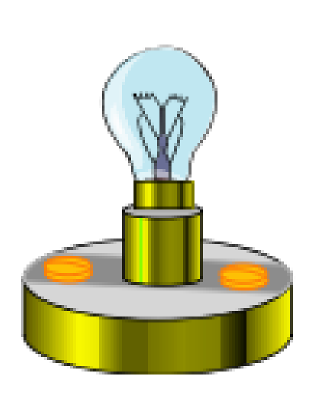
- The sum of potential and kinetic energy of an object is the same.



Science Activity

Observation:

- **What happens when you turn on the following devices?**







Put √ in front of the correct one

	Heat	Light	Sound
The electric Lamp converts electric energy to			
The electric Heater converts electric energy to			
The electric speaker converts electric energy to			

Conclusion:

- The same kind of energy changes into different types of energy
- Energy never created nor destroyed

The conservation law of Energy:

- Energy neither created nor destroyed, but it converted from one type to another.



Examples of Energy Transformation

The process	Energy used	Energy produced
On winding a spring toy	Kinetic	Potential
On leaving the spring free	Potential	Kinetic
Rubbing your hands	Kinetic	Heat
Hammering an iron piece	Kinetic	Heat & Sound
Metallic bell (school bell)	Kinetic	Sound
Electric heater, fire.	Electric	Heat
Electric fan	Electric	Kinetic
Electric lamp or bulb	Electric	Light
Battery (dry cells)	Chemical	Electric
Torch	Chemical	Electric →light
Running	Chemical	Heat →kinetic
Photosynthesis	Light	Chemical

Energy Transformation inside the car:

Car Engine	Chemical → Thermal → Mechanical
Car Dynamo	Kinetic → Electric
Car lamps	Electric → Light
Car air conditioner	Electric → Heat
Car Radio	Electric → Sound



Technological Applications of Energy Transformation:

Application	Energy changes
Sewing Machine	Electric energy into mechanical energy.
Solar Cells	Solar energy into electric energy.
A cellular Phone	Electromagnetic energy waves into sound energy.
Alarm Clock	Chemical energy into kinetic and sound energy.
Television	Electric energy into light and sound energy.

The negative effects of technology:

1. Environmental Pollution.
2. Harming human's life.
3. Bad use of Human in Wars and destruction.

Examples of the negative effect of the technological applications:

Application	Negative Effect	Disease
Car Exhaust	Air pollution	Chest and eye diseases.
Military Explosions	Huge destruction	Diseases leads to death.
Chemical Pesticides	Water, air, and soil pollution	Cancer.
Nuclear Weapons	Huge destruction.	Diseases leads to death.
Mobile Webs	Electromagnetic pollution	Heart diseases.



Lesson Review

Q1: Complete the following:

1. The energy never -------------------------- nor -------------------------- but, it is only converted from one type to another.
2. The car engine converts the energy from -------------------- to -------------------
3. The cell phone converts the energy from ------------------------ to ------------------
4. The energy is converted from -------------------------- to-------------------------- In the sewing machine.
5. The energy is converted from -------------------------- to -------------------------During running
6. In the photosynthesis process the energy converted from -------------------------- to --------------------------
7. The chemical pesticides cause -------------------------- disease.
8. car exhausts and air pollution cause ------------------------------ disease
9. the electromagnetic pollution cause -------------------------- disease
10. the chemical pesticides cause -------------------------- disease

Q2: Give reason for each of the following:

1. **The energy never lost nor gained.**

   ----
2. **Cars have negative effect on the environment and the man.**

   ----
3. **The chemical pesticides have negative effect on man health.**



Q3: Complete the following:

The process	Energy used	Energy produced
On winding a spring toy		
On leaving the spring free		
Rubbing your hands		
Hammering an iron piece		
Metallic bell (school bell)		
Electric heater, fire.		
Electric fan		
Electric lamp or bulb		
Battery (dry cells)		
Torch		
Running		
Photosynthesis		

Car Engine		→		→
Car Dynamo		→		
Car lamps		→		
Car air conditioner		→		
Car Radio		→		



Lesson Three:

Heat Energy

Heat Energy:

Form of energy, which transfers from higher temperature to lower one

- Heat transfer stops when the temperature of them are equal.

We get the heat through many ways



1. Sun.
2. Fire.
3. Friction.
    - The friction is a method to generate heat
    - Friction converts ***mechanical energy*** into ***heat energy***.

Science Activity

Observation:

- **What happens when you peddle your bicycle very fast and then try to touch the tires?**



Put √ in front of the correct one

	Hot	Cold	Nothing
Your hands feel the tires			

	Potential	Kinetic	Heat
You started with			
You ended with			

Conclusion:

- The friction changes the kinetic energy into heat energy

The temperature:

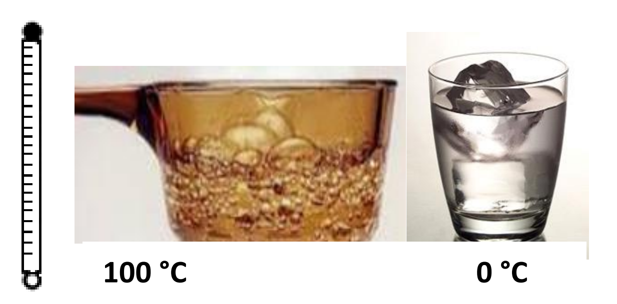
The condition that states the direction of heat energy transfer

- The energy transfer happens when the object touches another body.
- The temperature is directly proportional to the particles' kinetic energy.

Science Activity

Observation:

- **What happens when you mix hot water to cold water?**
  - Use a thermometer to measure the temperature



Put √ in front of the correct one

	High temperature	Low temperature
The hot water has		
The cold water has		

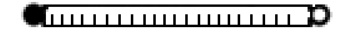
	More than 70 °C	Less than 30 °C	Around 50 °C
The final temperature			

Conclusion:

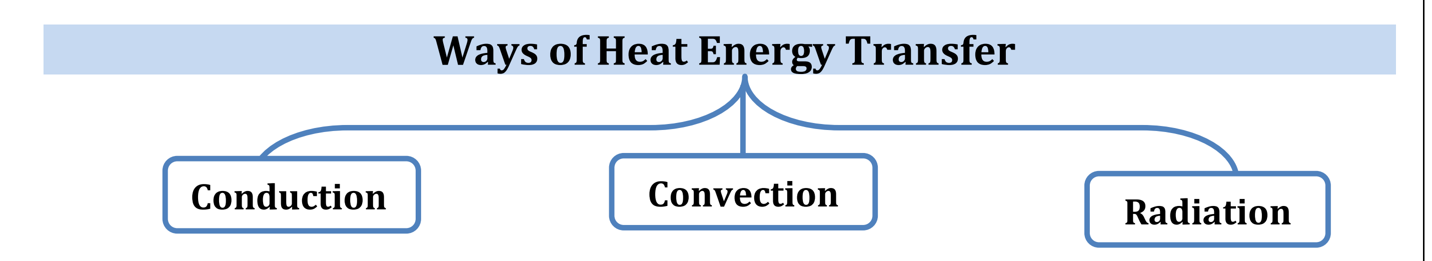
- The friction changes the kinetic energy into heat energy

Facts:

- Heat transfers from an object of higher temperature to another of lower temperature.
- Heat transfer stops when the temperature of the two media becomes equal.
- The temperature is measured by **thermometer**.







1. Heat Transfer by Conduction:

- It is the transfer of heat energy through solid particles
- Ex: Transfer of heat through solids.

Application.

- **Making cooking pans of copper or aluminum. (Give Reason)**
  Because they are good conductors of heat.

Science Activity

Observation:

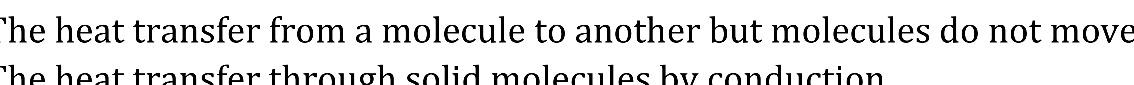
- **What happens when you stir a hot tea with a metal spoon?**



	Hotter	Colder
The spoon become		

	move	Stay still
The molecules of the spoon		

Conclusion:



- The heat transfer through solid molecules by conduction

2. Heat transfer by Convection:

- It is the transfer of heat in gas and liquid molecules
- **How it happens?**
  Hot molecules have less density so they rise upwards, while colder molecules have more density so they fall down.
- Heat transfer by convection need material medium to transfer.

Applications.

1. **The air condition always are at the upper part of the room. (Give Reason)**
   Because they release cold air with high density so it falls down, while the hot air with less density rises up to cool again

2. **The electric heater always are at the lower part of the room. (Give Reason)**
   Because they release hot air with low density so it rises up, while the cold air with less density falls down to cool again

Science Activity

Observation:

- **How the vapor moves?**





Put √ in front of the correct one

	Down ward	Up ward
The cold vapor moves		
The hot vapor moves		

Conclusion:

- Cold air is heavy and fall down, while hot air is light and rise up
- Ups and downs of air known as **convection current**



3. Heat transfer by radiation:

- It is the transfer of heat through gas molecules and empty space (vacuum)
- Heat transfer by radiation does not need medium molecules.

Application.

1. Heat transfer from fire to man's hands by radiation not convection. (G.R)

Because the air is bad conductor of heat, so it carried by radiation not by convection.

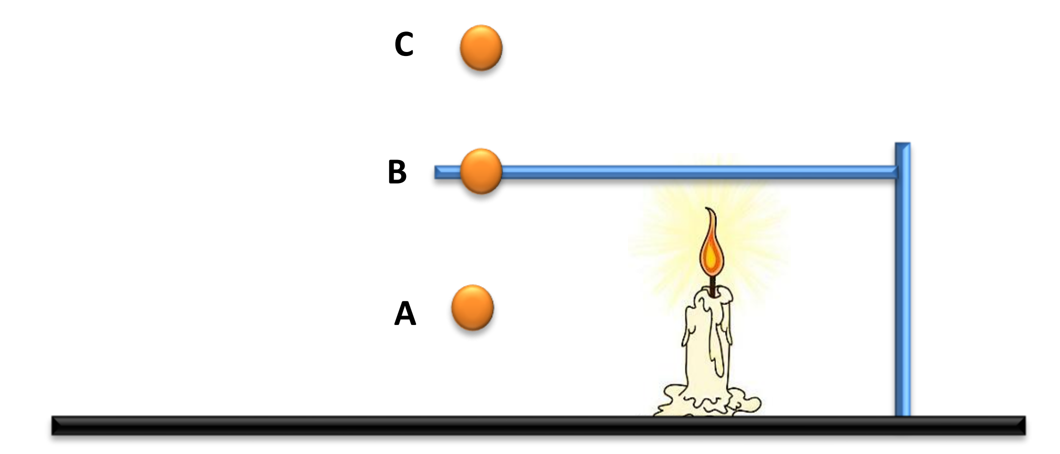
2. Heat of the sun does not reach the earth by radiation not convection. (G.R)

Because of the space between the earth and the sun.

Science Activity

Observation:

- **What is the most accepted way to transfer the heat to different points?**



Put √ in front of the correct one

	Conduction	Convection	Radiation
The heat transfers to A by			
The heat transfers to B by			
The heat transfers to C by			



Solar Energy

- The energy comes from the sun.
- The origin of most energy resources on the earth and its forms.
- The cleanest source of energy, as it does not pollute the environment.

The solar energy is essential for other forms of energy. (Give Reason)

1. Solar energy generates the wind movement
2. Producing electricity by using solar cells
3. Solar energy is stored in plants as chemical energy by photosynthesis
4. Solar energy is stored in petroleum **(**fuel**)** as chemical energy

Application of solar energy

1. Solar Cells	Converts Solar energy changes into electric energy.
2. Solar heater	Converts Solar energy changes into heat energy.
3. Fresh Water	desalination seawater **(** to get fresh water**)**
4. Space	Operating Satellites and space ships

Technological Applications depending on heat energy:

	Energy in	The Resource	The effect
Electric heater	Electricity	Renewable	Non-polluted
Solar heater	The sun	Permanent	Non-polluted
Electric stove	Electricity	Renewable	Non-polluted
Gas oven	Natural gas	Non-renewable	Polluted



Lesson Review

Q1: Choose the correct answer:

1. The energy transfer from sun to earth by -----------------

a. Convection **b.** Convection and radiation
c. Conduction **d.** Radiation

2. The energy transfer from fire to man's hand by -----------------

a. Convection **b.** Convection and radiation
c. Conduction **d.** Radiation

3. The energy transfer from electric heater to us by -----------------

a. Convection **b.** Convection and radiation
c. Conduction **d.** Radiation

4. The energy transfer from hot tea to the cup holding it by -----------------

a. Convection **b.** Convection and radiation
c. Conduction **d.** Radiation

5. The energy transfer from through boiling water by -----------------

a. Convection **b.** radiation and conduction
c. Conduction **d.** Radiation

6. The energy transfer from stove to the metal pot by -----------------

a. Convection **b.** Convection and radiation
c. Conduction **d.** Radiation

7. When air heats up its density -----------------

a. decrease **b.** stay still
c. increase **d.** decrease then increase

8. When air cools down its density -----------------

a. decrease **b.** stay still
c. increase **d.** decrease then increase



Q2: Complete the following:

1. The heat energy is a form of energy which is transferred from object --------------- temperature to object with --------------- temperature
2. The heat energy transfer stops when the temperature of the 2 objects become ----------------
3. The ------------------------- is the way in which the heat energy does not need any medium to transfer
4. The ------------------------- is a way in which the heat energy needs any medium to transfer
5. The heat transfers by ------------------------------ Through liquids and gases.
6. The condition which state the direction of the heat energy from or to the object when it is connected to another object is known as ---------------------------------
7. The temperature is direct proportional to ---------------------------------
8. Gases controls the heat transfer by two ways they are --------------------------------- and ---------------------------------
9. The solar energy is stored in the plants in the form of --------------------------------- by the photosynthesis sis process.
10. The solar energy is the reason for --------------------------------- movement.
11. In the fuel, the --------------------------------- energy is stored as a chemical energy.
12. We can use ---------------------------------energy t desalinate the sea water
13. The solar cell converts ----------------------- energy to ---------------------- energy
14. The solar stove converts ------------------------- energy to -------------------------- energy



Q3: Give reason for each of the following:

1. **The air conditioner is always at the upper part of the room.**

   ----
2. **Making cooking pans of copper or aluminum.**

   ----
3. **The electric heater is always at the bottom of the room.**

   ----
4. **The heat transfers to the outer space by radiation not by convection.**

   ----
5. **Heat energy produced from the solar energy is preferable to the heat produced from burning fuel.**

   ----
6. **Sun is the cleanest source of energy.**

Q4: what happens if?

1. **The air conditioner is at the lower part of the room.**

   ----
2. **The air heats up.**



Unit Three

Adaptation and Diversity





Lesson one:

Diversity and classification

Taxonomy

A science that searches similarities and differences among living organisms.

- It places the similar ones in the same group and call it **Species**. **(Give reason)** to make them easy for studying.

Species

A group of living organism similar in **shape** and **way of feeding** and can **reproduce**.

- The individuals of the same species can give birth of new fertile individuals to reproduce and keeping the existence of species.

Example: Cat species

- A group of different **cats** but similar in shape, way of feeding and can reproduce among each other

- Mating (marriage) can occur between the different groups of the same species but they produce a sterile female (cannot reproduce)
  - The donkey and zebra produces a sterile female called " **<u>Zonkey</u>** "
  - The donkey and horse produce a sterile female called **"<u>mule</u>"**



Diversity in living Organisms:

1. Diversity of animals

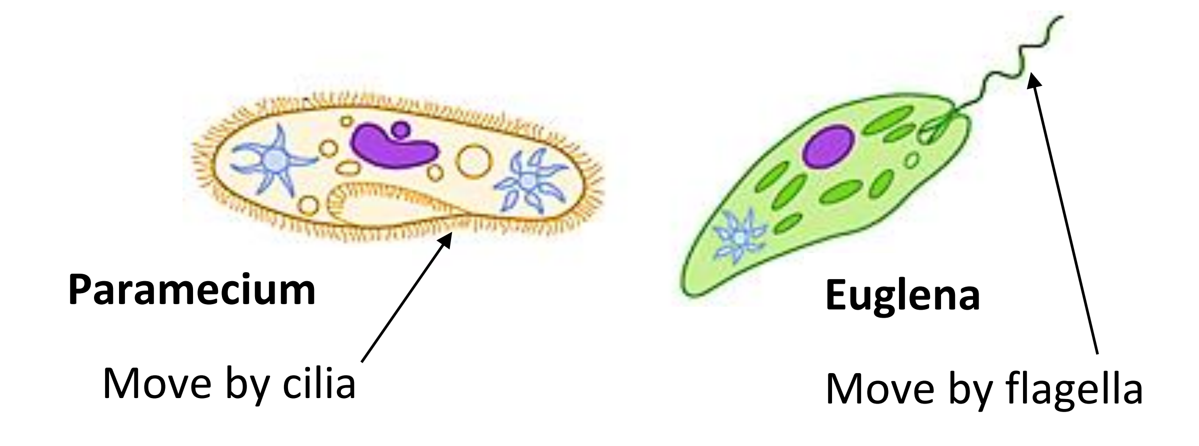
The way of feeding.	**Herbivorous,** plant eater	Horse
	Carnivorous, meat eater	Tiger
The Size	**Big animals**	Elephant
	Small animals	Rat
The environment	**Water**	Shark
	Land	Horse

2. Diversity in plants

Size of tree	**Huge trees**	Palm
	Short weeds	flowers
The Size of leaves	**Small sized leaves**	Strawberry
	Large sized leaves	Banana

3. Diversity in Microorganisms

- Organisms cannot be seen naked eye, **and** unicellular organisms (one cell)
- They live in **(**air – water – soil**) and** differ in shape and their way of movement





Classification of the living organisms.

1. Classification of plants.

Plants are classified according to (***External shape*** - ***Way of reproduction***).

Classification according to External Shape.

a) Some plants not have roots, stems and leaves	Wheat,
b) Some plants have roots, stems and leaves	Brown Algae, Red Algae

Classification according to The Way of Reproduction.

<table>
<tr><td>a) Plants reproduce by spores</td><td colspan="2">Ferns, small terrestrial plants.
- Adiantum</td></tr>
<tr><td rowspan="5">b) Plants reproduce by seeds.</td><td>Gymnosperm
(cone)</td><td>Pine</td></tr>
<tr><td rowspan="4">Angiosperm
(Fruit Envelope)</td><td>Mono-cotyledon</td></tr>
<tr><td>Wheat</td></tr>
<tr><td>Di-cotyledon</td></tr>
<tr><td>Bean</td></tr>
</table>



Bean



Wheat



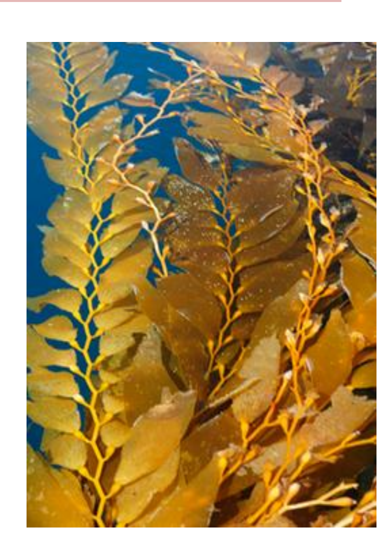


Adiantum





Pine



Brown Algae

2. Classification of animals.

Classification of animals according to the nature of body support

a) Soft body	- Jelly fish - Earth worm	
b) Supported body	**External Support**	- Snails - Roach
	Internal Support	**All vertebrates** - **Mammals:** Dog - **Birds:** Hawk - **Reptiles:** lizard



Jelly fish



Earth worm



Snail





Dog



Hawk



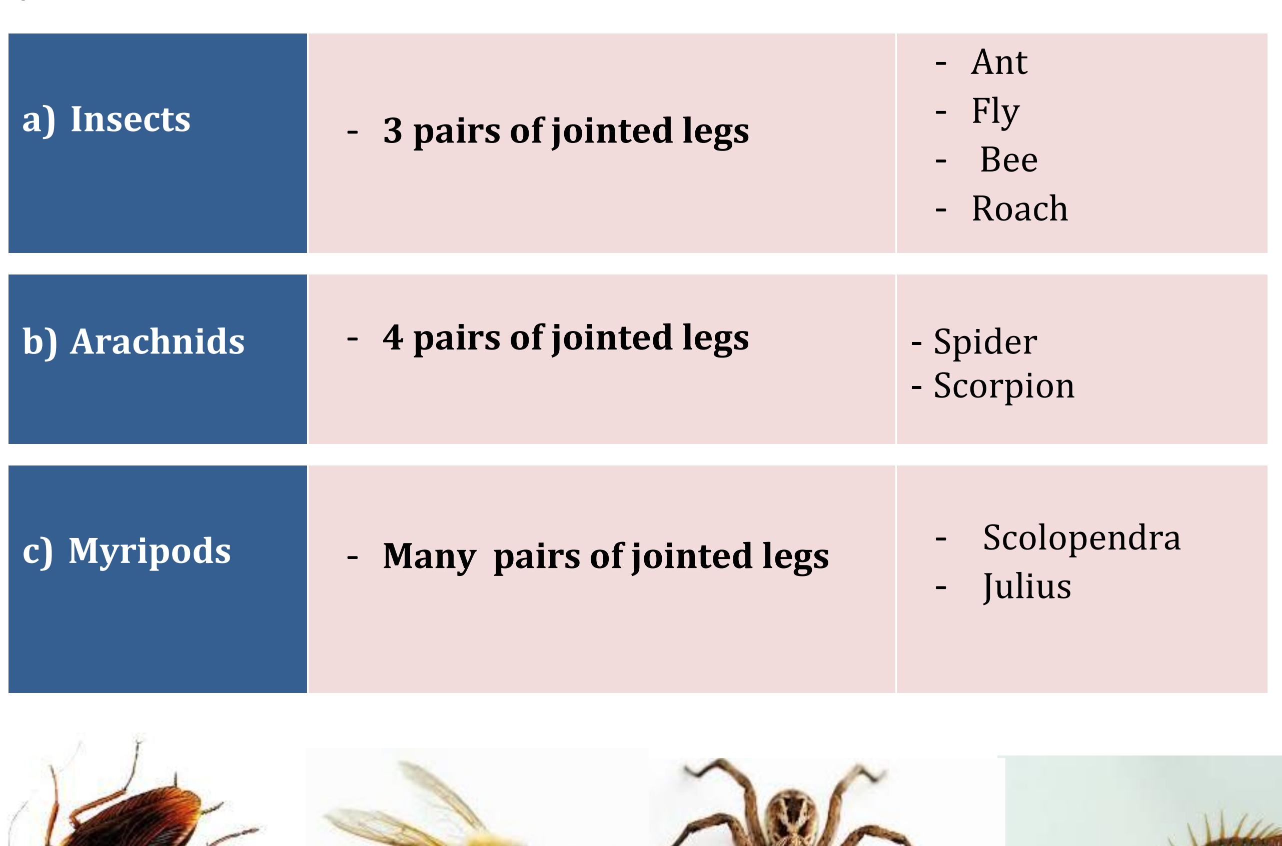
Lizard

Classification of arthropods according to the number of legs.

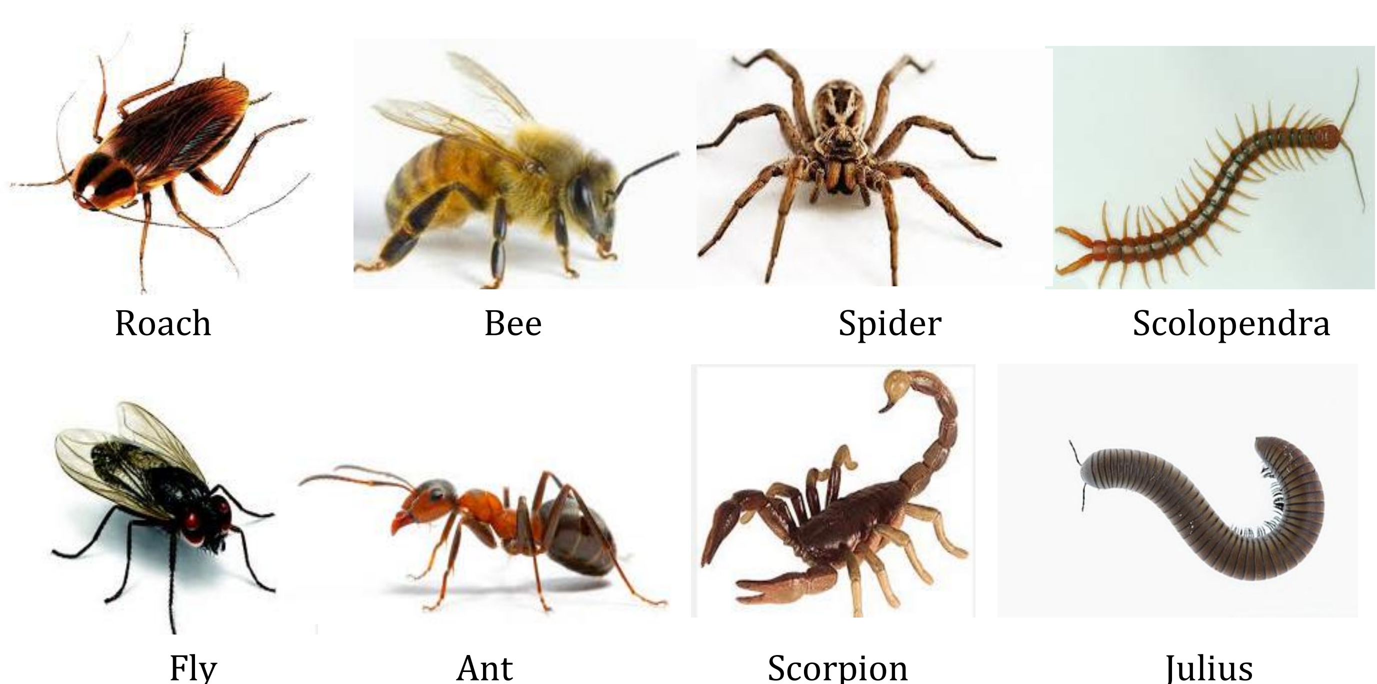
- **Arthropods**

  They are invertebrate characterized by jointed legs.

They are classified into



a) Insects	- **3 pairs of jointed legs**	- Ant - Fly - Bee - Roach
b) Arachnids	- **4 pairs of jointed legs**	- Spider - Scorpion
c) Myripods	- **Many pairs of jointed legs**	- Scolopendra - Julius



Roach Bee Spider Scolopendra

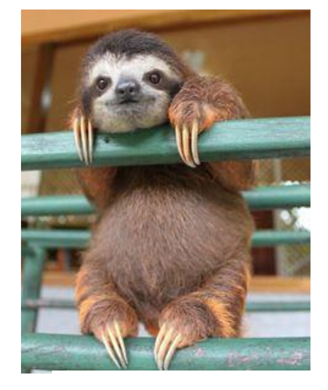
Fly Ant Scorpion Julius



<u>Classification of mammals according to the number and the kind of teeth.</u>

They are classified into

<table>
<tr><td>a) Edentates.
- Toothless -</td><td colspan="2">- Jelly fish
- Earth worm</td></tr>
<tr><td rowspan="6">b) Having teeth.</td><td>Front outward teeth</td><td>- Hedgehog</td></tr>
<tr><td>Sharp Canines</td><td>- Tiger</td></tr>
<tr><td rowspan="4">Sharp incisors</td><td>Rodents</td></tr>
<tr><td>1 pair in upper jaw
- Squirrel</td></tr>
<tr><td>Lagomorphs</td></tr>
<tr><td>2 pairs in upper jaw
- Rabbit</td></tr>
</table>



Sloth



Armadillo



Hedgehog



Tiger



Squirrel



Rabbit



Lesson Review

Q1: Complete the following:

1. The basic unit of classification of the living organisms is the ----------------------
2. The science that classify the organisms into similar groups is ----------------------
3. Plants may carry large-sized leaves such as ------------------------- and some has small sized leaves such as -------------------------
4. When you examine a pond water drop by a microscope some micro-organisms can be seen such as -------------------------, -------------------------
5. Plants may reproduce by spores such as ------------------------- and other plants reproduce by seeds such as -------------------------
6. Arthropods are classified according to the number of legs into -------------------, -------------------------, -------------------------
7. The cockroach belongs to the ------------------------- whereas the scorpion belongs to -------------------------
8. Toothless mammals such as ------------------------- and -------------------------
9. Armadillo is one of the ------------------------- mammals and hedgehog belongs to ------------------------- mammals
10. The number of the jerboa's upper jaw incisors is ------------------------- and their number in the rabbit's upper jaw is -------------------------

Q2: Cross out the odd word in each of the groups below:

1. Locust - Mosquito - Spider - Cockroach - Flies
2. Lion - Tiger - Dog - Wolf - Armadillo
3. Beans - Pea - Corn - Pine - Wheat
4. Octopus - Desert snail - Frog - Fresh water mussels - Tilapia



Q3: Choose the correct answer:

1. The scorpion belongs to ------------------

a. Arachnids **b.** Edentates
c. Myripods **d.** Insects

2. Plants that reproduce by spores such as ------------------------

a. Pine c. Beans
b. Adiantum d. Wheat

3. The animals which don't have a body support such as -----------------------------

a. Earth worm **b.** Shark
c. Jelly fish **d.** a and c

4. The number of pairs in scorpion legs is ------------------------------

a. 2 **b.** 10
c. 3 **d.** 4

5. The fly is a/an ------------------------------

a. Bird **b.** Animal
c. Insect **d.** Arachnid

6. Some plants have no roots, stem as ----------------------------------

a. Algae **b.** Rice
c. Flowers **d.** Bean

7. The plants reproduce by seeds called ----------------------------------

a. Flowering plants **b.** Rose
c. Ferns **d.** Algae

8. Some living organisms are microscopic as ----------------------------------

a. Dust **b.** Grass
c. Ant **d.** Paramecium

Lesson Two:

Adaptation and Diversity

The change and diversity in the environments where the living organisms live was the reason leads to the diversity in the living organisms to cope with the environmental changes such as

1. Climate
2. Food
3. Availability of the water

<u>Adaptation</u>

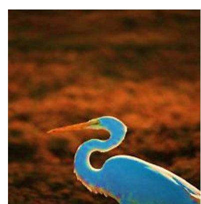
A change in behavior, body structure or function to fit the environmental changes.

Science Activity

Observe and answer the questions?







	Camel	Hawk	Whale	Bat	Heron
Which one can walk on sand					
Which one can hunt preys					
Which one can swim and dive					
Which one can fly in dark					
Which one can pick up worms					

<u>Reasons for Adaptation:</u>

1) To get food
2) To escape from enemies.
3) Way of motion



Types of Adaptation

Structural Adaptation	Functional Adaptation	Behavioral Adaptation

1) Structural Adaptation. (Anatomical)

- It is an adaptation in the structure of a body organ.

Camel's Pads	Horse's Hooves
- A thick flat . (**Give Reason**) - Enable camels to move on hot sand.	- Strong solid.` (Give Reason) - Enable horses to move solid rocky soil.

2) Functional Adaptation.

- It is an adaptation of some organs and tissues to do a specific function.
- Example,
    a) Secreting poison in snakes.
    b) Secreting sweat in humans on hot days.

3) Behavioral Adaptation.

- It is an adaptation in the life activity of some animals.
- Example,
    a) Activity of birds during daytime.
    b) Activity of bats at night.
    c) Migration of some birds a certain of the year.

Adaptation and Motion Diversity in Mammals:

Animal	Modification	Reason
Whale	- The fore limbs are paddles.	- Swimming
Bat	- The fore limbs are wings.	- Flying.
Horses	- The 4 limbs with hooves.	- Run on rocks.
Monkeys	- The fore limbs are long.	- Climb trees.

Adaptation and Nature of Food:

Birds	Modification in beaks and legs.
1. Predators Vultures	**Beaks**: Sharp strong crooked to tear preys. **Leg**: Sharp claws front and back catch preys
2. Insectivores Hoopoe	**Beaks** : long and thin to pick worms **Legs**: long, thin and e to walk in water.
3. Water animals Duck	**Beaks**: wide and hollow to filter food. **Legs**: palm legs to swim.

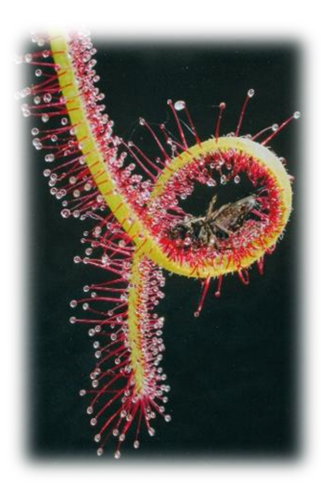
Adaptation in Insect Eating Plants (Insectivorous):

- These plants get carbohydrates from photosynthesis.
- They get proteins by catching insects and digesting them.

- **Modification**.

    Leaves of plants can capture and digest insects then absorb the nitrogen.

- **Examples.**

Drosera **sticks and rolls the insect then digests it.**




Dieonea **sticks and catches the insect then digests it.**



Lesson Review

Q1: Complete the following:

1. Camel's pad is a kind of ------------------------ adaptation

- **a.** Functional
- **b.** No
- **c.** Behavioral
- **d.** Structural

2. Hunting at night of a bat is a kind of ------------------------ adaptation

- **a.** Functional
- **b.** No
- **c.** Behavioral
- **d.** Structural

3. Poison of a snake is a kind of ------------------------ adaptation

- **a.** Functional
- **b.** No
- **c.** Behavioral
- **d.** Structural

4. The birds that have crooked beaks are ------------------------

- **a.** Predator birds
- **b.** Domestic birds
- **c.** Water birds
- **d.** Insectivores birds

5. Dieonea is a kind of ------------------------

- **a.** Predator birds
- **b.** Domestic plant
- **c.** Water plants
- **d.** Insectivores plants

6. The duck has ------------------------

- **a.** Palm leg
- **b.** Small leg with claws
- **c.** Thin leg
- **d.** Long leg

7. The ------------------------ has long arms to climb the tree

- **a.** Monkey
- **b.** Dolphin
- **c.** Octopus
- **d.** Tiger

8. Hoopoe is a kind of ------------------------

- **a.** Predator birds
- **b.** Domestic birds
- **c.** Water birds
- **d.** Insectivores birds



Q1: Complete the following:

1. Insectivorous plants such as --------------------, ----------------------------.
2. Hawks have --------------------------- beaks to tear the prey, whereas ducks have ---------------------------- beaks to filter food from water.
3. Horse's limbs end in ------------------------- to run over rocky soil whereas camel's limbs end in -------------------------- to walk on hot sand.
4. The poisons gland in the snake is a kind of ----------------------------- adaptation
5. The duck and goose have ------------------- and ----------------------- beak to filter the food from the water
6. The whale front limbs are modified into --------------------------------- to swim, whereas they modified in the bat into ---------------------------------to fly
7. The hereon and hoopoe have ------------------------- beaks to pick the worms
8. Insectivores plants get their protein from ------------------------

Q3: Give the reason:

1. **Hereon and hoopoe have long thin beaks and long legs.**

   ----
2. **Some plants hunt insects.**

   ----
3. **Hawks have sharp claws and strong claws.**

   ----
4. **Camel has a flat thick pad.**

Lesson Three:

Adaptation & life continuity

- Some animals could not adapt with the change in the surrounding environment, so as **Dinosaurs**, **Mammoth**.

- Other animals had adapted to the changes so they continued life.



Mammoth

Examples of Adaptation in Living Organisms.

1. Hibernation

In winter, some animals stop their feeding and bury themselves in mud to overcome the cold.



Frog



Lizard

2. Aestivation

In summer, some animals avoid shortage of water by hiding away from the sun in tunnels.



Jerboa



Desert Snail

3. Birds Migration

In winter, some birds leave cold places to warm places where they could reproduce. They return to their normal life in the spring.



4. Hiding

Camouflage: the ability of some animals to hide from their enemies.





<u>Stick Insect</u>	**<u>Leaf Insect</u>**	**<u>Chameleon</u>**
Looks like the plant branches.	Looks like the plant leaves.	Take the color of the place to escape from enemy.

5. Water plants

Elodea (Submerged water plant)	
Roots	Weak because the plant does not need to fix itself or absorb water.
Stem	- Elastic to avoid breaking by water currents, - Contains air for respiration and help in floating.
Leaves	Small and ribbon like to make them stronger.

6. Desert Plants.

Plants like **Cactus** – **Opuntia** – **Calamagrostis** grow in desert.

Calamagrostis		
Roots	Extend **Vertically** down the soil to reach underground water.	
Stem	Flexible to avoid cutting in strong wind	
Leaves	Small and spiraled with little stomata to decrease water loss.	

Opuntia		
Roots	Extend **Horizontally** around the soil to absorb rain and dew	
Stem	Contain chloroplasts for Photosynthesis	
Leaves	Covered with wax and reduced into spines to decrease water loss.	

Cactus		
Roots	Fine roots and close to the soil surface	
Stem	Short to avoid strong wind	
Leaves	Juicy leaves with water content and covered with wax to decrease water loss	

The Camel

- **The camel called The Desert Ship. (Give Reason)**
  Bec. It can survive for many days without water and food

Eye lashes.	- Long eyelashes to avoid sand storms.
Nostrils	- Opening and close to avoid sand storms.
Ears.	- Small ears, covered by hair to avoid sand.
Upper lip.	- Forked and the teeth - Strong enamel teeth to eat spiny plants.
Body fur.	- Dense back to protect from cold - Less dense at legs to protect from hot
Legs.	- Thick skinned to protect it hot - Flat pad to avoid sinking in smooth sand.
Blood.	- Blood temperature is changes • from **34°C** in the morning • to **41°C** during daylight
Sweat glands.	- They do not start sweating unless the blood temperature reaches **40°C**.
Storing Fats.	- Camel's hump store fats to still alive for 3 months without food.
Water.	- Camel drinks about 100 liters of water in 10 minutes - This can keep it for one week without water



Lesson Review

Q1: Choose the correct answer:

1. There are air chambers in the leaves of --------------- plant.

a. Opuntia b. Calamagrostis
c. Cactus d. Elodea

2. Leaves reduced into spines in ----------------- plant.

a. Opuntia b. Calamagrostis
c. Cactus d. Elodea

3. Water is stored in the leaves of -------------- plant.

a. Wheat b. Calamagrostis
c. Cactus d. Elodea

4. The examples of living organisms that undergoes hibernation is the -----------

a. Desert snail c. Frog
b. Jerboa d. All the above

Q2: Give an example showing each of the following:

1. Camouflage in insects

----

2. Hibernation in amphibians

----

3. Aestivation in rodents

----

4. A totally submerged aquatic plant

----

5. A desert plant that its root are into juicy roots



Q3: What happens in each of the following?

1. **Ending of camel's legs with a pad**

   ----

2. **Rising of camel's body temperature to $40^{o}C$.**

   ----

3. **Absence of air chambers from elodea stem.**

Give reasons for each of the following:

1. **Some animals undergo hibernation**

   ----

2. **Some species of birds migrate from their original habitats in Winter**

   ----

3. **The presence of air chambers in elodea's stem**

   ----

4. **Camel has fur on the back.**

